



By: [Earl Joseph](#)

Appro, SDSC and ScaleMP Apply SSD Technology to Dramatically Increase the Speed of Supercomputers

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The [San Diego Supercomputer Center](#) at UC San Diego, [Appro](#) and [ScaleMP](#) have been researching and developing a new way to speed up HPC clusters by using high speed SSD drives installed close to the processors to improve bandwidth to and reduce latency. They announced their research plans and described the system on September 2nd, 2009.

The project is called "[Dash](#)" and system highlights include:

- It has 68 [Appro GreenBlade nodes](#), which are dual-socket, using quad-core Intel Xeon processors
 - It has 48 gigabytes (GB) of DRAM memory on each node
- It uses Intel SATA Solid-State Drives (SSDs)
 - Dash's use of flash memory is for fast file-access and swap space (often called scratch disk space)
- Four of the nodes in the system are configured as I/O nodes
 - Each I/O node can deliver up to 1 terabyte (TB) of flash memory to any other node
 - It uses new I/O controllers developed by Intel Corporation and integrated by Appro International, Inc.
- Its has an InfiniBand interconnect
- It employs vSMP Foundation software from ScaleMP, Inc.
 - This provides virtual symmetric multiprocessing capabilities and aggregates all of the memory across 16 nodes into shared memory "supernodes."
 - This provides users with access to as much as 768 GB of shared DRAM memory in addition to the 1 TB of flash memory per "supernode."

Comments from the research team about the system:

- Michael Norman, interim director of SDSC explained: "Today's high-performance instruments, simulations and sensor networks are creating a deluge of data that presents formidable challenges to store and analyze, challenges that Dash helps to overcome."
- Steve Lyness, VP of HPC Solutions for Appro International Inc., "Appro is exploring and developing new technologies to provide higher performance within industry standard clusters, and the use of SSDs in the 'Dash' system is a great example of the difference this can make for HPC users."
- Allan Snavelly, associate director at SDSC: "Dash can do random data accesses one order-of-magnitude faster than other machines. This means it can solve data-mining problems that are looking for the proverbial 'needle in the haystack' more than 10 times faster than could be done on even much larger supercomputers that still rely on older 'spinning disk' technology."

The system is designed to help researchers looking for solutions to data-intensive problems that arise in astrophysics, genomics and many other domains of science. For example, Dash will have the capability to search sky survey data for near-earth asteroids and brown dwarfs that may help researchers better understand periodic extinctions on Earth. It will speed up investigations to establish relationships among species based on their genes. Such research could not only yield new information regarding evolution,

but help biomedical researchers mine these complex data sets for clues to develop new drugs or cures for a variety of diseases.

Dash is currently being tested but soon will be made available to users of the TeraGrid, the nation's largest open-access scientific discovery infrastructure, for evaluation and development of application codes that can take advantage of flash memory and virtual "supernodes" technology

IDC Opinion:

It is great to see new technologies being researched and deployed that have both the ability to increase performance and reduce power consumption. Placing SSDs closer to main memory and processors offers interesting new options for designing HPC systems. HPC sites are already starting to deploy SSD flash memory for uses such as metadata. IDC believes that SSD memory will be increasingly used in HPC, especially as its costs come down, because of the substantial advantages it offers in speed.

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